MEMORANDUM FOR: Executive Secretary, Suggestion Awards Committee

SUBJECT : Employee Suggestion 74-175

1. Let us first quote from the article, GO(SI) in the Change to Metric by Richard E. Myers. . ."At the 11th General Conference on Weights and Measures in 1960, a system known as Systems International d'Unites (SI) was adopted. The United States was a signatory to this agreement. The SI Metric System should delight the hearts of all scientists and engineers in its basic simplicity and ease of mathematical manipulation. The SI system has only seven base units as follows: length, meter (m); mass (not weight); kilogram (kg); time, second (s); electric current, ampere (A); temperature, kelvin (K); luminous intensity, candela (cd); amount of substance, mole (mol). Two supplementary units are used; the radian (rad) and the steradian (sr) for measuring plane and solid angles. Other units of measurement are derived from these seven units or consist of a base unit combination. A few of them are: frequency, hertz (Hz); force, newton (N); pressure or stress, pascal (Pa); work, energy or quantity of heat, joule (J); power, watt (W). There are several other derived units to complete the system. . ."

2. About three years ago the President tasked the Congress to undertake a study to develop a plan which would permit a gradual conversion of the United States to the SI metric system. In theory this would be a 10-year conversion plan; in practice it may take somewhat longer, especially considering the size of the industrial base which must be converted. To make a point here, it is evident that the suggestor does not have an original idea in terms of general applications. Specifics will be dealt with below.

3. Now for progress - it is important to note that what is proposed is a partial, not wholesale, conversion to a metric system. However, progress is being made in many areas. The observant shopper may note that box contents of many foods are cited in gram weights as well as in ounces. Fifth and sixth grade students in some elementary schools are being taught the basics of the metric system. Heavy industry is beginning to use metric standards in those areas where the commodities involved make conversion a simple matter. You can now purchase rulers and tapes with measurements expressed in metrics as well as in the more conventional inches, feet, etc.

4. But to the suggestion that the Agency make a unilateral conversion to the metric system, I must rejoin with a resounding -- NO! While I agree that the metric system is simpler and more rational (?) than our conventional measurements (if understood and used by all), and it may well be that NASA and the National Bureau of Standards have some applications of metrics peculiar

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to certain types of work inherent in both agencies, the rest of the Federal Government (and most of the country) still employs conventional measurements. What the suggestor proposes would produce some kind of chaos. One small example of a problem area would be the entire Federal stock numbering system. Another thing -- you may want to order your paper supplies by the meter, but if the manufacturer makes and sells his paper by the yard, you are just out of luck.

5. Per Mr. Myers, the metric system has been legal in this country since 1866, and we have been wrestling with the conversion problem without notable success until the past decade. Conversion costs appear to be the main factor in the delay. But as stated, progress is being made and the conversion must not only be gradual -- it must also govern how all of us (including the Agency) will measure. To quote Myers again "Miss America may well be proud of the fact that her proportions are 914-(D)-610-914, but will she want her weight advertised as 535 newtons?. . ." So it would seem that we will also have some philosophical adjustments to make before we dive headlong into the meter stick shoe sizes.

6. The suggestor should be thanked for his thoughtful and entertaining idea, which is not in itself bad - just a few years ahead of its time.

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[redacted]
Chairman, Internal Suggestion Awards Panel
Office of Logistics

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GO (SI) IN THE CHANGE TO METRIC

by Richard E. Meyers

At this point in our history there are few in the industrial world who doubt that the United States will go metric. It is just a matter of when, and how complete the transition will be when it happens. While the metric system has been legal in the United States since 1866, the question of metric conversion has been avoided or studied to death without action. The usual roadblock is that the change would be too costly. It is getting costlier by the day, but it appears there is finally enough emphasis to get the inevitable change underway.

At the 11th General Conference on Weights and Measures in 1960, a system known as Systems International d'Unites (SI) was adopted. The United States was a signatory to this agreement. The SI metric system should delight the hearts of all scientists and engineers in its basic simplicity and ease of mathematical manipulation. The SI system has only seven base units as follows: length, meter (m); mass (not weight), kilogram (kg); time, second (s); electric current, ampere (A); temperature, kelvin (K); luminous intensity, candela (cd); amount of substance, mole (mol). Two supplementary units are used; the radian (rad) and the steradian (sr) for measuring plane and solid angles. Other units of measurement are derived from these seven units or consist of a base unit combination. A few of these are: frequency, hertz (Hz); force, newton (N); pressure or stress, pascal (Pa); work, energy or quantity of heat, joule (J); power, watt (W). There are several other derived units to complete the system.

This is not the metric system in general use in metric countries today. While some of the base units are familiar enough, many other units in SI are used only in the scientific and technical community. The mechanic still checks RPM, not radians per second. Speed limits are in kilometers per hour, not meters per second. The housewife buys [illegible] — a mass unit -- not by newtons. Tires are inflated and stress is measured in kilograms per square centimeter — a no-no in SI — not in MPa, mega pascals per square meter. Presently, some threaded fasteners are, however, in SI units. Temperature is taken in centigrade, not kelvin.

If we really get with it SI may well have a better chance of succeeding in the United States ahead of the metric countries. We have to unlearn anyway in order to adopt any new system, and conversion charts will be with us a long time. We may as well go all the way to SI and possibly, then, lead the world in adopting the simplest total measurement system yet devised by man.

Habits and attitudes are difficult to change, as anyone interested in performance improvement knows. There will be real roadblocks to adopting any new measuring system. Regardless of logic, emotion is the first reaction, and years of tradition and practice are formidable obstacles to change. The adoption problems of a new system are not with the very young, for they have less to unlearn, but rather with the older and experienced. Dual dimensioning, conversion charts, multiple stocking and tools in both old and new systems will aid the transition. In fact, these devices will be absolute necessities. The housewife on her budget will want to know what a five-newton pack of butter is worth compared to a pound, and what lies between a millimeter and a meter.

When the schools really "get with" teaching metric, let's hope it's SI and not just a batch of conversions. The academic community, below the college level, is not too prone to taking advice from industry on curriculum improvements. It is suggested that, in the change to metric, they actively solicit advice from industry who uses their output, the student. Metric teaching should start in the lowest grades with the basics, with minimum reference to conversion charts. For the young student, conversion data will be necessary mainly to refer to the English — and American -- measuring system that once was; not the reverse.

The women's influence will be a strong factor in the rate of adoption of any metric system, particularly SI. Miss America may well be proud of the fact that her proportions are 914-(D)-610-914, but will she want her weight advertised as 535 newtons? Notwithstanding the scientifically sanitary SI system, she might prefer fifty-four kilograms and care less that it's a mass unit and not force. The change to metric shoe and clothing sizes may come easier, and the meter stick replacing the yardstick is not too radical. In the kitchen, volume measurements can become portions of the cubic meter, but don't expect expressions like 10+3 to 10-2 to become household jargon. These are fine in a technical environment, but if the scientist really wants the United States to go SI, he must realize that terms will develop that are more universally understood. It is more likely that the word prefixes such as kilo- and centi-, and possibly some not legal as pure SI, will develop and be used.

Since its inception around 1945, value engineering has been a force for change. Not for the sake of change, but rather to let the required functions dictate the best course to progress. It may be difficult for value engineers to make an immediate case for shift to SI, but with a little imagination, the longer range case is there. It is the writer's view that all interested in performance improvement should consider a shift to the SI system of units. It is possibly worth some discussion at VE and performance improvement seminars. In VE it can be related to specific functions such as indicate mass, measure force, or others. Long range economics will make the change to metric and, hopefully, SI inevitable. Value engineers can be leaders in the change. Let's go!

No attempt has been made in this writing to go into detail of the metric system or SI. The Metric Association has a bibliography on the subject. The National Bureau of Standards has data and the writings of Jim Palmer are excellent on the subject of SI. [E]